

A new Gripopterygidae (Plecoptera) species from southern Patagonia

PABLO PESSACQ

Laboratorio de Investigaciones en Ecología y Sistemática Animal (LIESA), Universidad Nacional de la Patagonia San Juan Bosco, Sarmiento 849, 9200. Esquel, Chubut, Argentina. E-mail: pablopessacq@yahoo.com.ar

Abstract

The male, female, and last instar larva of *Andiperlodes tehuelche* n. sp., an apterous species of Gripopterygidae, are described from the Santa Cruz Province, Argentinean Patagonia.

Key words: *Andiperlodes tehuelche*, new species, Gripopterygidae

Introduction

The family Gripopterygidae is represented in South America by 26 genera and 82 species (Stark et al. 2009) and in Patagonia by 22 genera and 48 species (Pessacq 2009). As stated by McLellan & Zwick (2007), the intergeneric relations of the family are not clear, the subfamily concept needs reconstruction and the parameters of the present genera need re-adjusting. Additionally, most genera are delimited by character combinations, without explicit synapomorphies being stated.

At present, three monotypic genera of apterous Gripopterygidae are known, all of them from the southernmost part of Patagonia (Illies 1963): *Andiperla* Aubert, 1956, *Andiperlodes* Illies, 1963 and *Megandiperla* Illies, 1960. These genera also share the absence of ocelli (presumed for unknown males of *Andiperlodes holdgatei* Illies, 1964), and a terrestrial habitat (presumed for males of *A. holdgatei*). Here, a new apterous species from the same region is described.

Materials and methods

Figures were drawn with the aid of a camera lucida coupled to a Leica MZ6 stereomicroscope and a Leica DMLB microscope. All the specimens are deposited in the Museo de La Plata collection (MLP), La Plata, Buenos Aires, Argentina. Biogeographical areas are according to Morrone (2006).

Larvae and adults were associated based on their extreme similarities and the fact that it was the only Plecoptera species collected in the sampling site. All larvae collected were of the final instar.

Andiperlodes tehuelche Pessacq, sp. nov.

(Figs. 1–4)

Diagnosis: This is the smallest species of Patagonian Gripopterygidae that lack wings. It is distinguished from other Patagonian species by an exceptionally wide pronotum in both adults and in the nymphs and by the lack of an epiproct in the males.

Male holotype. Measurements (in mm): Total length 5.4, head max. width 1.0, antennae 4.5, pronotum max. width 1.4, pronotum max. length 0.8, cerci 1.3. Stout, dark, heavily sclerotised, medium size gripterygids, with long antennae and relatively short cerci.

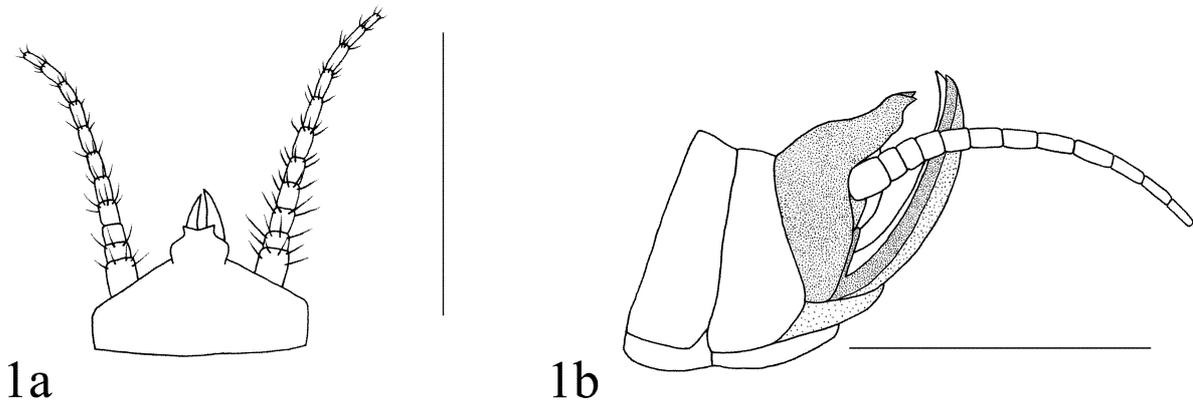


FIGURE 1. *Andiperlodes tehuelche* male. 1a, abdominal segment X, dorsal view. 1b, abdominal segments VII–X, lateral view. Scales 1 mm.

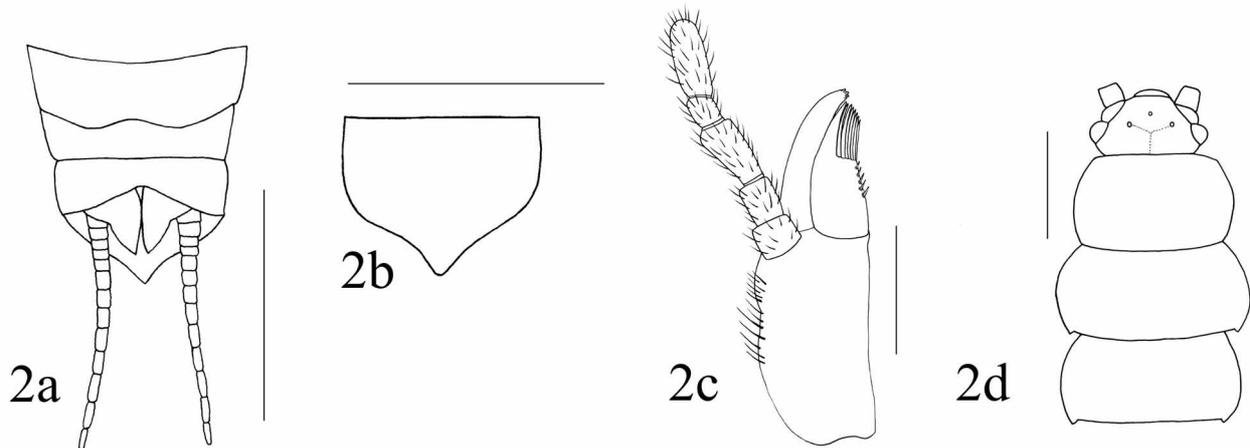


FIGURE 2. *Andiperlodes tehuelche* female. 2a, abdominal segments VII–X, ventral view. 2b, abdominal segment X, dorsal view. 2c, left maxilla, dorsal view. 2d, head and thorax, dorsal view. Scales for fig. C: 0,25 mm, for figs. a, b and d: 1 mm.

Head. Dark brown, with a posterior brown band behind the eyes and labrum; covered with hair-like setae, with one longer and thicker hair-like seta at base of each antenna. Eyes small, three very small ocelli. Cephalic suture poorly visible. Antenna as long as 4.5 max. head width, covered with hair-like setae, scape and pedicel dark brown, the first the largest, second smaller, about two times first flagellar annulus length; flagellum brown, with 27–28 annuli, last ones slightly thinner and longer. Maxillae with a five-segmented palp, fifth palpomere the longest, followed in length by the third, the fourth is shortest.

Thorax. Dorsally dark brown, ventrally light brown; wide, covered with hair-like setae, more densely on its margins. Pronotum dark brown, rectangular, 1.7 times as wide as long, margins slightly concave, angles rounded. Mesonotum 2.5 times as wide as long, anterior margin concave, lateral and posterior margins convex, the latter with small triangular lateral projections pointing backwards, resembling small larval wingpads. Metanotum 2.7 times as wide as long, anterior margin straight, lateral margins convex, posterior margin concave, also with triangular lateral projections pointing backwards. Legs relatively thick, covered with short curved hair-like setae, dorsal and lateral sides with sparse, thin, straight spine-like setae between the curved ones. Apical third of femora dark brown, basal two thirds light brown; slightly expanded on the

ventral margin of basal third and with a dense row of hair-like setae on it. Tibiae dark brown, with two small tibial spurs. Tarsi brown, distal tarsomere the longest, proportions about 2:1:3; tarsal claws acute.

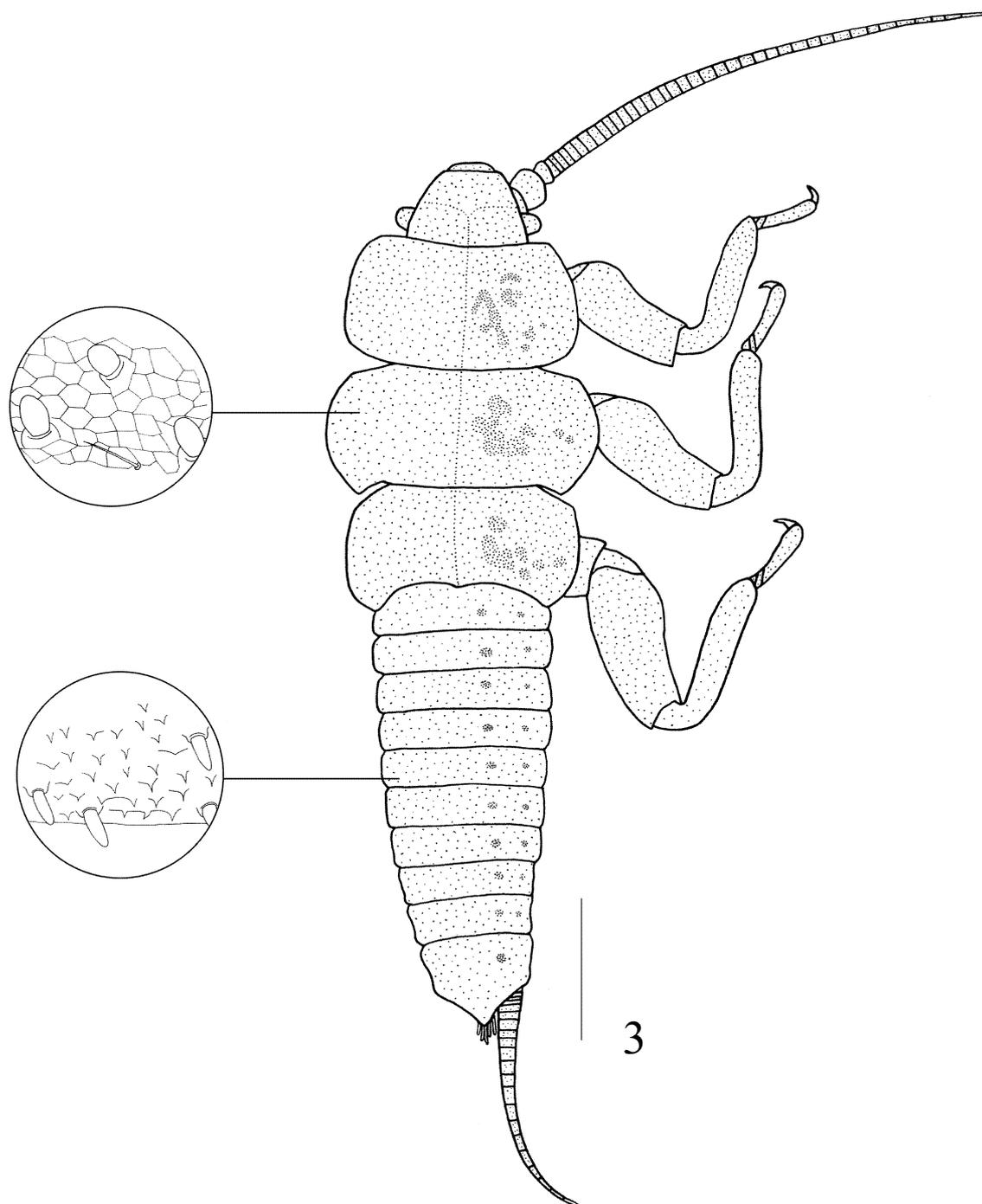


FIGURE 3. *Andiperlodes tehuelche* larva, habitus and detail of cuticula. Scale: 1 mm.

Abdomen. Dorsally dark brown, ventrally light brown, its dorsal surface covered with hair-like setae. Terga heavily sclerotised, sterna sclerotised. Tergum X extends posteriorly, forming from dorsal view a slightly laterally expanded lobe ending in a pair of points (Figs. 1a, 1b). Epiproct absent. Paraprocts (Fig. 1b) well developed, curved upwards and surpassing segment X dorsally, apex acute, dorsal half well sclerotised, ventral half poorly sclerotised. Cerci composed of 12 segments, covered with curved hair-like setae and sparse, thin, straight spine-like setae.

Female allotype. Same as male holotype, except for: Measurements (in mm): Total length 6.4, head max. width 1.1, antennae 4, pronotum max. width 1.6, pronotum max. length 1, cerci 1.1.

Head (Fig. 2d): with two brown areas by the sides of the eyes. Antennae dark brown, as long as 3.6 head maximum width. Maxilla (Fig. 2c) with a five-segment palp, fifth palpomere the longest, followed in length by the third, fourth the shortest. Galea with several small conical projections on its apex; lacinia with one long and acute tooth on its outer apical margin, a dense row of six to eight thick and long subapical setae and six short thick setae on inner margin.

Thorax (Fig. 2d): Pronotum, rectangular, 1.7 times as wide as long. Mesonotum 2.2 times as wide as long. Metanotum 2.4 times as wide as long, anterior margin slightly concave, posterior margin straight. Legs: Tibiae with two tibial spurs.

Abdomen: segment X produced dorsodistally in an acute angle (Fig. 2b). Subgenital plate extending over ninth sternum, with two very shallow rounded lobes. Paraproct wide, pointed (Fig. 2a). Cerci composed of 13 segments, covered with hair-like setae and an irregular apical ring of hair-like setae.

Last instar larva. Measurements (in mm, n=10): Total length 5.94 ± 0.33 , head max. width 0.98 ± 0.04 , antennae 3.38 ± 0.24 , pronotum max. width 1.51 ± 0.05 , pronotum max. length 0.83 ± 0.05 , cerci 1.55 ± 0.15 . Stout, well sclerotised brown larva, with thick legs, long antennae and relatively short cerci (Fig. 3).

Head: Brown, covered with minute setae and with an irregular pentagonal or octagonal cuticular pattern only visible under high magnification. Eyes small, no ocelli. Cephalic suture poorly developed. Antennae as long as 3.4 max. head width, scape and pedicel brown, the first the largest, second much smaller, about two times first flagellar annulus length; flagellum light brown, with 35–45 annuli progressively thinner and slightly longer, with an apical ring of short setae. Labrum trapezoidal, anterior margin with a very shallow middle depression and a row of minute setae, lateral margins slightly convergent anteriorly, base with several long hair-like setae on its dorsal side. Right mandible (Fig. 4a) with two blunt apical teeth united at their base, followed by a series of six much smaller teeth in two rows, basal to these teeth one big tooth, with a smaller one on its base; mola with a row of small, short and blunt denticles. Left mandible (Fig. 4 b) with six teeth, four apical ones short, blunt, and broadly united on their base, two basal ones clearly differentiated and acute; mola extremely complex with four irregular rows of denticles of different length and with both acute or blunt apex. Four long hair-like setae on molar base. Maxilla (Fig. 4c) with a five-segmented palp, fifth palpomere the longest, followed in length by the fourth, remaining ones about the same size; basal palpomere limits poorly visible. Galea tapering distally, with several short projections on its apex, several subapical short setae on its ventral side and three long hair-like setae on its inner surface; lacinia with six to ten short setae on its inner margin, a dense row of eight to ten thick and long subapical setae and several small rounded apical teeth, hidden by the setae in dorsal view. Labium (Fig. 4d) longer than wide, with a three-segmented palp, distal palpomere the longest, with several short hair-like setae, remaining two about the same size, with no setae; glossa with a dense bunch of hair-like setae on its apex, paraglossae with long hair-like setae, longer on its outer margin, but absent from inner margin.

Thorax: Dorsally brown, with an irregular darker pattern on disc of every notum as in Fig. 3, ventrally light brown, wide, covered with short minute hair like setae and short rounded minute setae and with an irregular pentagonal or octagonal cuticular pattern only visible under magnification (detail in Fig. 3), margins with a continuous row of small spine-like setae. Pronotum 1.79 ± 0.1 times as wide as long, maximum width 1.54 ± 0.06 times head maximum width, anterior margin slightly concave, posterior and lateral margins slightly convex; angles rounded. Mesonotum 2.3 ± 0.5 times as wide as long, maximum width 1.75 ± 0.16 times head maximum width, anterior and lateral margins convex, posterior margin concave with triangular lateral projections pointing backwards resembling small wing pads. Metanotum 2.1 ± 0.3 times as wide as long, maximum width 1.5 ± 0.44 times maximum head width, anterior margin slightly concave, lateral margins convex and posterior margin concave, with a shallow projection in its center and with triangular lateral projections pointing backwards resembling small wing pads.

Legs: dorsally brown, ventrally light brown, thick. Femora (Fig. 4e) distinctly expanded on the ventral margin of basal third, covered with short rounded setae on its posterior margin and dorsal side and short spine-

like setae on its anterior margin as in Fig. 4e, ventro-distal angle acute; tibiae light brown covered with short setae, no tibial spurs; tarsi (Fig. 4f) light brown, with a ventral row of hair-like setae, sparse hair-like setae on its surface and two small spine-like setae on its apex, distal tarsomere the longest, proportions as follows: 1.5:1:5; tarsal claws acute.

Abdomen: Brown, ventrally light brown, its dorsal surface sparsely covered with short thick minute setae and scale-like pointed cuticular projections (detail in Fig. 3), distal margin with a row of minute setae. Sternum I very small, terga and sterna II–III separated by narrow membranous pleura; segments IV–IX forming a complete ring, segment X forms a distally oblique cylinder, produced dorsodistally in an acute lobe (Fig. 4g). Cerci composed of 18–22 segments, each of them progressively thinner and longer and with an apical ring of setae. Anal gills poorly developed. Paraproct well developed, with an acute tip.

Type material. Holotype male adult: ARGENTINA, Santa Cruz Province. Estancia La Angostura, nameless stream at the side of state route 29, -48.63028 latitude, - 70.61806 longitude

580 m asl. 21/II/2009, J. Muzón leg. Allotype, same data as holotype. Paratypes: 10 final instar larva, same data as holotype.

Etymology. *tehuelche* makes reference to the original inhabitants of the region where the species was collected.

Distribution. Southern steppe of Central Patagonia (Andean Region, Patagonian Subregion, Santa Cruz Province, Argentina)

Remarks. All specimens were collected in a small stream of about 1 m wide and 20 cm of depth, in the Patagonian Steppe.

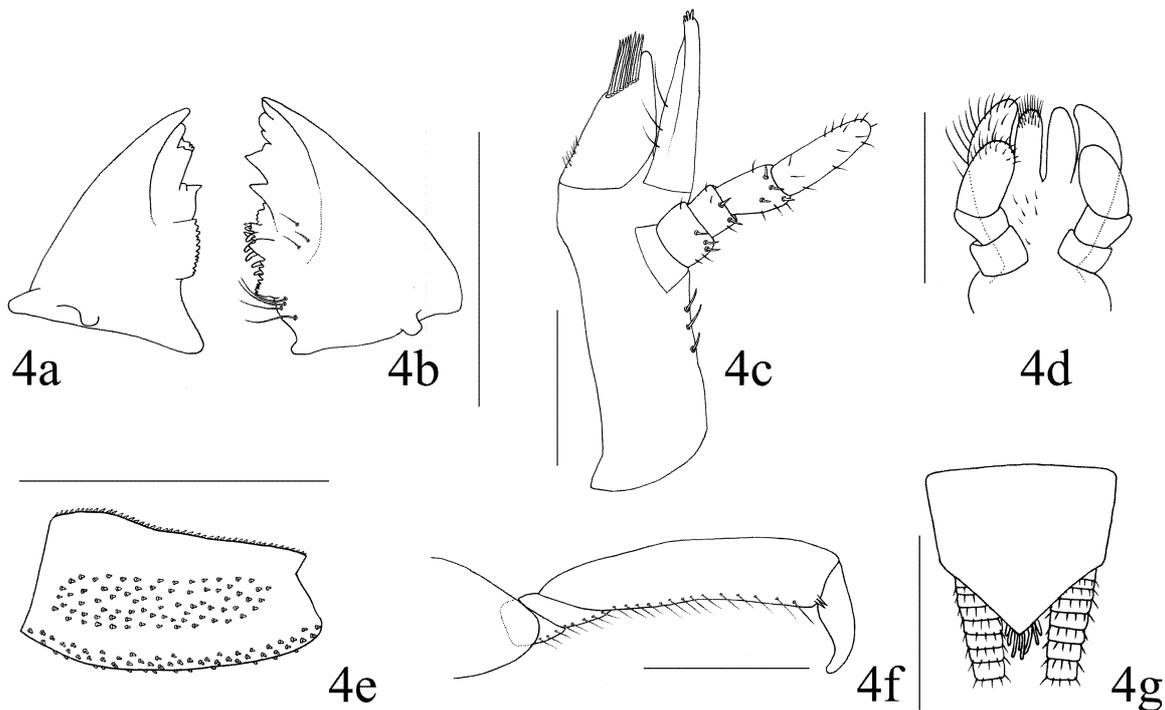


FIGURE 4. *Andiperlodes tehuelche* larva. 4a, right mandible, ventral view. 4b, left mandible, ventral view. 4c, right maxilla, dorsal view. 4d, labium, dorsal view. 4e, femur. 4f, tarsus. 4g, abdominal segment X, dorsal view. Scales for figs. a–d and f: 0.25 mm, for figs. e and g: 1 mm.

Discussion

When compared to the other known species of apterous Patagonian Gripopterygidae (*Andiperla willinki* Aubert, 1956, *Megandiperla kuscheli* Illies, 1960, *Andiperlodes holdgatei*), *Andiperlodes tehuelche* seems

closer to *A. holdgatei* (only known from its female) based on the habitus, the relative length of maxillary palpal segments and the shape of the lacinia. Given these similarities, and since the male and larva of *A. holdgatei* are still unknown, to avoid an unnecessary profusion of names, I provisionally place this new species within *Andiperlodes*.

Andiperlodes tehuelche differs from *A. holdgatei* in the presence of ocelli in the adult stage (absent in *A. holdgatei*), the smaller number of cercal segments (20–23 in *A. holdgatei*), in its wider pronotum (about as wide as head in *A. holdgatei*), and in its much shorter total length (10–12 mm in *A. holdgatei*). While *A. tehuelche* larvae are aquatic and the adults have ocelli, the other apterous species have terrestrial larvae, or presumed as terrestrial in *A. holdgatei* (Illies, 1964), and the adults lack ocelli.

The reduction or loss of the epiproct observed in *A. tehuelche*, is a character used to delimit species and genera within South American Gripopterygidae. This character is also observed in *Andiperla willinki*, *Potamoperla* Illies, 1963, *Unicauda pirata* McLellan & Zwick, 2007 (Andean), *Gripopteryx* Pictet, 1841, *Guaranyperla* Froehlich, 2001, *Paragripopteryx* Enderlein, 1909 and *Tupiperla* Froehlich, 1969 (Neotropical), and apparently has occurred several times independently (McLellan & Zwick 2007). The male segment X ending in two points observed in *A. tehuelche* is also shared with *Potamoperla myrmidon* (Mabille, 1891), *Paragripopteryx*, *Rhithroperla* Illies, 1963 and *Tupiperla*.

Andiperlodes tehuelche shares with *Potamoperla myrmidon* the loss of the epiproct and the male segment X ending in two points, but including the present species within *Potamoperla* seems inappropriate, since the larva and adult of both species are strikingly different (i.e. larval body covered with long setae, pronotum about as wide as head, and a slender habitus in *P. myrmidon*). Additionally, *P. testacea* Vera, 2006 posses a segment X ending in one point. Original descriptions of *P. testacea* and *U. pirata*, are very similar, and the synonymy of this species is possible with revision in the future.

The phylogenetic significance of the wingless condition, segment X ending in two points and the loss of epiproct is still unknown, since no cladistic analysis has been conducted for South American Gripopterygidae. Whether these and other characters have evolved independently or represent synapomorphies at the generic level is still unknown. The parameters of the present genera of Gripopterygidae need revising (McLellan & Zwick, 2007), and most Patagonian genera are based on combination of characters, without formal synapomorphies being stated. This lack of knowledge reinforces the provisional placement of the present species within *Andiperlodes*.

Within Patagonian Griopterygidae, probable uniquely derived characters for *A. tehuelche* larva are the shape of the femur (expanded in its basoventral third), the complex mola of the left mandible (composed of four rows of denticles), and the wide pronotum (about 1.5 times head width). The presence of ocelli in the adult stage and its absence in the larvae is unique to *A. tehuelche*. It must be addressed that ocelli are usually poorly visible in dark colored species, but no sign of these structures was observed in the studied specimens.

Andiperlodes tehuelche specimens were collected in the southern steppe of Central Patagonia (Andean region, Patagonian subregion, Santa Cruz Province), where the only Gripopterygidae previously recorded are *Antarctoperla michaelsoni* (Klapálek, 1904) and *Limnoperla jaffueli* (Navás, 1928) (Pessacq & Miserendino 2008). The other apterous Gripopterygidae species are distributed in the forest of Subandean Patagonia (Andean region, Patagonian subregion) and the Magellanic Forest (Andean region, Subantartic subregion).

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References

- Aubert, J. (1956) Plécoptères décrits par le R.P.L. NAVÁS S.J. 4. Liste des types actuellement connus. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 29, 437–445.
- Enderlein, G. (1909) Klassifikation der Plecopteren sowie Diagnosen neuer Gattungen und Arten. *Zoologischer Anzeiger*, 34, 385–419.
- Froehlich, C.G. (2001) *Guaranyperla*, a new genus in the Gripopterygidae (Plecoptera). In: Domínguez, E. (ed.), Trends in Research in Ephemeroptera and Plecoptera. *Kluwer Academic/ Plenum Publisher*. N. York. p. 377–383.
- Froehlich, C.G. (1969) Studies on Brazilian Plecoptera 1. Some *Gripopterygidae* from the Biological Station at Paranapiacaba, State of São Paulo. *Beitr. Neotrop. Fauna*, 6(1), 17–39.
- Illies, J. (1960) Die erste auch im Larvenstadium terrestrische Plecoptere. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 33, 161–168.
- Illies, J. (1963) Revision der südamerikanischen Gripopterygidae (Plecoptera). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 36, 145–248.
- Illies, J. (1964) Die Plecopteren-Unterfamilie Andiperlinae. *Zoologischer Anzeiger*, 172(1), 37–48.
- Klapálek, F. (1904) Plecopteren. In: *Hamburger Magalhaensische Sammelreise*, pp 1–30.
- Mabille, J. (1891) Sectio Plecoptera. In: *Néuroptères. Mission scientifique du Cap Horn, 1882–1883*, pp. 6–9.
- McLellan, I.D. & Zwick, P. (2007) New species of and keys to South American Gripopterygidae (Plecoptera). *Illiesia*, 3(4), 20–42.
- Morrone, J.J. (2006) Biogeographic areas and transition zones of Latin America and the Caribbean Islands based on panbiogeographic and cladistic analyses of the entomofauna. *Annual Reviews of Entomology*, 51, 467–494.
- Navás, L. (1928) Insectos neotrópicos. *Revista Chilena de Historia Natural*, 31, 231–232.
- Pessacq, P. (2009) El estado de conocimiento de los Plecoptera de Patagonia. *Revista de la Sociedad Entomológica Argentina*, 68 (1–2), 155–161.
- Pessacq, P. & Miserendino, M.L. (2008) Ephemeroptera and Plecoptera biodiversity in central Patagonia, Chubut province, Argentina. *Zootaxa*, 1817, 27–38.
- Pictet, F.J. (1841) *Historie Naturelle Générale et Particulière des Insectes Névroptères. Famille des Perlides*. Genève, 2 Bände.
- Stark, B.P., Froehlich, C.G. & del Carmen Zúñiga, M. (2009) *South American stoneflies (Plecoptera)*. Aquatic Biodiversity in Latin America Volume 5. Pensoft Publishers, Sofia-Moscow. 154 pp.
- Vera, A. (2006) Una nueva especie de Gripopterygidae de Chile, *Potamoperla testacea* n. sp. (Insecta: Plecoptera). *Gayana*, 70(2), 168–175.